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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/551,699	11/21/2005	Jose Miguel Mulet Salort	BJS-4982-4	8024
23117 7590 01/23/2009 NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203				
EXAMINER				
WORLEY, CATHY KINGDON				
ART UNIT		PAPER NUMBER		
1638				
MAIL DATE		DELIVERY MODE		
01/23/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/551,699

**Applicant(s)**

MULET SALORT ET AL.

**Examiner**

CATHY K. WORLEY

**Art Unit**

1638

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 October 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 2 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 2 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SG/US)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on Oct. 29, 2008, has been entered.

2. Claims 1 and 2 are pending and are examined in this Office Action.

### ***Objections and Rejections that are Withdrawn***

3. The objection to claim 1 is withdrawn in light of the Applicant's amendments to the claims.

4. The rejection of claims 1 and 2 under 35 USC 112, first paragraph, for lack of scope of enablement is withdrawn in light of the Applicant's amendments to the claims.

5. The rejection of claims 1 and 2 under 35 USC 102(b) over Alexandrov et al is withdrawn in light of the Applicant's amendments to the claims, because Alexandrov et al do not teach or fairly suggest screening for the recited phenotypes.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bailey et al (US Patent No. 5,959,187, issued on Sept. 28, 1999) in view of Town et al (GenBank Accession NM\_111887; published on Jan. 10, 2002; pp. 1-2).

The claims are drawn to a method for producing plants with an altered characteristic by transforming the plants with a nucleic acid encoding SEQ ID NO:4 and selecting for plants with the characteristic.

The instant claims are obvious over the prior art because the prior art teaches a method which differed from the claimed method by substitution of the precise amino acid sequence encoded by the transgene. The method of the instant invention differs only by substituting a nucleic acid encoding SEQ ID NO:4 for the nucleic acids taught in the prior art references. One of ordinary skill in the art

could have substituted a nucleic acid encoding SEQ ID NO:4, and the results of this substitution would have been predictable.

#### SCOPE AND CONTENT OF THE PRIOR ART

Bailey et al teach a method of making transgenic plants expressing a Vitreoscilla hemoglobin (see claims 1-38 and entire document). They teach that germination was accelerated, growth rates and final yields (including dry weight) were enhanced, and the period between germination and flowering was reduced (see column 13, lines 13-24), and they teach screening for improved agronomic characteristics such as faster growth, greater vegetative or reproductive yields or improved protein contents, etc. (see column 10, lines 21-26). Bailey et al specifically teach that their invention could be made with a number of different oxygen-binding proteins, and they suggest any hemoglobin or globin-like protein (see column 2).

#### DIFFERENCES BETWEEN THE CLAIMED INVENTION AND THE TEACHINGS OF BAILEY ET AL

Bailey et al do not teach a nucleic acid encoding SEQ ID NO:4 or comprising SEQ ID NO:3, nor do they specifically teach increased seed yield.

#### SCOPE AND CONTENT OF THE PRIOR ART – SECONDARY REFERENCE

Town et al teach the nucleic acid of SEQ ID NO:3 which encodes SEQ ID NO:4 (see alignment appended to this Office Action). They teach that it is a class 2 non symbiotic hemoglobin (see annotations in GenBank record).

#### LEVEL OF ORDINARY SKILL IN THE PERTINANT ART

The pertinent art is the field of molecular biology, and one of ordinary skill in this art would have earned a Ph.D. in molecular biology, biochemistry, plant biology, or some other related field. One of ordinary skill in this art would have been well-versed in techniques for heterologous expression of recombinant proteins and would be familiar with the literature encompassing genetic engineering of crop plants, as evidenced by the skill level of Bailey, Town, and their co-authors.

#### FINDING OF OBVIOUSNESS

At the time the invention was made, it would have been obvious and within the scope of one of ordinary skill in the art to follow the teachings and suggestions of Bailey et al to make transgenic plants comprising a heterologous hemoglobin in their genome and arrive at the instant invention. It would have also been obvious and within the scope of one of ordinary skill in the art to modify the method taught by Bailey et al to use a nucleic acid comprising SEQ ID NO:3 and encoding SEQ ID NO:4 as taught by Town et al. One of ordinary skill in the art could have modified the teachings of Bailey et al to substitute the nucleic acid taught by Town et al to arrive at the method of the instant claim. One of ordinary skill in the art would have predicted that the result would be a method of making transgenic plants expressing hemoglobin and having the characteristics taught by Bailey et al (accelerated germination, increased growth rates, increased final yields, increased dry weight, reduced period between germination and flowering, greater vegetative yields, greater reproductive yields, etc). Bailey et al teach that many different

oxygen-bonding proteins can be utilized in their invention (see title and background), therefore, one would have had an expectation of success in expressing any hemoglobin, including the Arabidopsis hemoglobin that comprises SEQ ID NO:4.

With regard to screening for particular characteristics, Bailey et al specifically teach screening for improved agronomic characteristics such as faster growth, greater vegetative or reproductive yields or improved protein contents, etc. (see column 10, lines 21-26). One type of greater reproductive yield is an increase in seed yield, and therefore, one of ordinary skill in the art would have been motivated to measure the seed yield and select for high producers as this is a very desirable trait.

For these reasons, the instant claims are obvious over Bailey et al in view of Town et al.

7. No claim is allowed.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CATHY K. WORLEY whose telephone number is (571)272-8784. The examiner is on a variable schedule but can normally be reached on M-F 10:00 - 4:00, with additional variable hours before 10:00 and after 4:00 with additional variable hours before 10:00 and after 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anne Marie Grunberg, can be reached on (571) 272-0975. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Cathy K. Worley/  
Patent Examiner, Art Unit 1638



# ALIGNMENT

## RESULT 1

HLB2\_ARATH

ID HBL2\_ARATH Reviewed; 158 AA.  
AC O24521;  
DT 05-DEC-2001, integrated into UniProtKB/Swiss-Prot.  
DT 01-JAN-1998, sequence version 1.  
DT 24-JUL-2007, entry version 49.  
DE Non-symbiotic hemoglobin 2 (Hb2) (ARATH GLB2).  
GN Name=AHB2; Synonyms=GLB2; OrderedLocusNames=At3g10520;  
GN ORFNames=F13M14.20, F18K10.9;  
OS Arabidopsis thaliana (Mouse-ear cress).  
OC Eukaryota; Viridiplantae; Streptophyta; Embryophyta; Tracheophyta;  
OC Spermatophyta; Magnoliophyta; eudicotyledons; core eudicotyledons;  
OC rosids; eurosids II; Brassicales; Brassicaceae; Arabidopsis.  
OX NCBI\_TaxID=3702;  
RN [1]  
RP NUCLEOTIDE SEQUENCE [GENOMIC DNA], AND CHARACTERIZATION.  
RC STRAIN=cv. C24;  
RX MEDLINE=98004552; PubMed=9342391; DOI=10.1073/pnas.94.22.12230;  
RA Trevasakis B., Watts R.A., Andersson C.R., Llewellyn D.J.,  
RA Hargrove M.S., Olson J.S., Dennis E.S., Peacock W.J.;  
RT "Two hemoglobin genes in Arabidopsis thaliana: the evolutionary  
RT origins of leghemoglobins."  
RL **Proc. Natl. Acad. Sci. U.S.A. 94:12230-12234(1997).**  
RN [2]  
RP NUCLEOTIDE SEQUENCE [LARGE SCALE GENOMIC DNA].  
RC STRAIN=cv. Columbia;  
RX MEDLINE=21016720; PubMed=11130713; DOI=10.1038/35048706;  
RA Salanoubat M., Lemcke K., Rieger M., Ansorge W., Unseld M.,  
RA Fartmann B., Valle G., Bloecker H., Perez-Alonso M., Obermaier B.,  
RA Delseny M., Boutry M., Grivell L.A., Mache R., Puigdomenech P.,  
RA De Simone V., Choise N., Artiguenave F., Robert C., Brottier P.,  
RA Wincker P., Cattolico L., Weissenbach J., Saurin W., Quetier F.,  
RA Schaefer M., Mueller-Auer S., Gabel C., Fuchs M., Benes V.,  
RA Wurmbach E., Drzonek H., Erfle H., Jordan N., Bangert S.,  
RA Wiedelmann R., Kranz H., Voss H., Holland R., Brandt P., Nyakatura G.,  
RA Vezzi A., D'Angelo M., Pallavicini A., Toppo S., Simonati B.,  
RA Conrad A., Hornischer K., Kauer G., Loehnert T.-H., Nordstieck G.,  
RA Reichelt J., Scharfe M., Schoen O., Bargues N., Terol J., Climent J.,  
RA Navarro P., Collado C., Perez-Perez A., Ottenwaelder B., Duchemin D.,  
RA Cooke R., Laudie M., Berger-Llauro C., Purnelle B., Masuy D.,  
RA de Haan M., Maarse A.C., Alcaraz J.-P., Cottet A., Casacuberta E.,  
RA Monfort A., Argiriou A., Flores M., Liguori R., Vitale D.,  
RA Mannhaupt G., Haase D., Schoof H., Rudd S., Zaccaria P., Mewes H.-W.,  
RA Mayer K.F.X., Kaul S., Town C.D., Koo H.L., Tallon L.J., Jenkins J.,  
RA Rooney T., Rizzo M., Walts A., Utterback T., Fujii C.Y., Shea T.P.,  
RA Creasy T.H., Haas B., Maiti R., Wu D., Peterson J., Van Aken S.,  
RA Pai G., Militscher J., Sellers P., Gill J.E., Feldblyum T.V.,  
RA Preuss D., Lin X., Nierman W.C., Salzberg S.L., White O., Venter J.C.,  
RA Fraser C.M., Kaneko T., Nakamura Y., Sato S., Kato T., Asamizu E.,  
RA Sasamoto S., Kimura T., Idesawa K., Kawashima K., Kishida Y.,

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RA Kiyokawa C., Kohara M., Matsumoto M., Matsuno A., Muraki A.,  
 RA Nakayama S., Nakazaki N., Shinpo S., Takeuchi C., Wada T.,  
 RA Watanabe A., Yamada M., Yasuda M., Tabata S.;  
 RT "Sequence and analysis of chromosome 3 of the plant *Arabidopsis*  
 RT *thaliana*.";  
 RL Nature 408:820-822(2000).  
 RN [3]  
 RP NUCLEOTIDE SEQUENCE [LARGE SCALE MRNA].  
 RA Brover V.V., Trukhan M.E., Alexandrov N.A., Lu Y.-P., Flavell R.B.,  
 RA Feldmann K.A.;  
 RT "Full-length cDNA from *Arabidopsis thaliana*.";  
 RL Submitted (MAR-2002) to the EMBL/GenBank/DDBJ databases.  
 CC !- FUNCTION: May not function as an oxygen storage or transport  
 CC protein, but might act as an oxygen sensor or play a role in  
 CC electron transfer, possibly to a bound oxygen molecule. Has a low  
 CC affinity for O(2).  
 CC !- SUBUNIT: Unable to dimerize (Probable).  
 CC !- TISSUE SPECIFICITY: Expressed in rosette leaves but not in roots.  
 CC !- INDUCTION: By low temperature but not by low oxygen levels,  
 CC dehydration, heat shock, wounding or oxidative stress.  
 CC !- SIMILARITY: Belongs to the plant globin family.  
 CC -----  
 CC Copyrighted by the UniProt Consortium, see <http://www.uniprot.org/terms>  
 CC Distributed under the Creative Commons Attribution-NoDerivs License  
 CC -----  
 DR EMBL; U94999; AAB82770.1; -; Genomic\_DNA.  
 DR EMBL; AC011560; AAG51381.1; -; Genomic\_DNA.  
 DR EMBL; AC013428; AAF76353.1; -; Genomic\_DNA.  
 DR EMBL; AY087650; AAM65188.1; -; mRNA.  
 DR UniGene; At.48644; -.  
 DR HSSF; P02240; 2GDM.  
 DR GenomeReviews; BA000014\_GR; AT3G10520.  
 DR KEGG; ath:At3g10520; -.  
 DR TAIR; **At3g10520**; -.  
 DR ArrayExpress; O24521; -.  
 DR GermOnline; AT3G10520; *Arabidopsis thaliana*.  
 DR InterPro; IPR000971; Globin.  
 DR InterPro; IPR012292; Globin\_related.  
 DR InterPro; IPR001032; Leghaemoglobin.  
 DR InterPro; IPR014611; Leghaemoglobin\_plant.  
 DR Gene3D; G3DSA:1.10.490.10; Globin\_related; 1.  
 DR Pfam; PF00042; Globin; 1.  
 DR PIRSF; PIRSF036520; Hgb\_plant; 1.  
 DR PRINTS; PR00188; PLANTGLOBIN.  
 DR PROSITE; PS01033; GLOBIN; 1.  
 DR PROSITE; PS00208; PLANT\_GLOBIN; 1.  
 PE 1: Evidence at protein level;  
 KW Heme; Iron; Metal-binding.  
 FT CHAIN 1 158 Non-symbiotic hemoglobin 2.  
 FT /FTID=PRO\_0000193012.  
 FT METAL 66 66 Iron (heme distal ligand) (By  
 FT similarity).

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FT METAL 101 101 Iron (heme proximal ligand) (By  
 FT similarity).  
 SQ SEQUENCE 158 AA; 17871 MW; 9E3E145432E0BEA0 CRC64;

Query Match 100.0%; Score 808; DB 1; Length 158;  
 Best Local Similarity 100.0%; Pred. No. 2.3e-62;  
 Matches 158; Conservative 0; Mismatches 0; Indels 0; Gaps  
 0;

Qy 1 MGEIGFTEKQEALVKESWEILKQDIPKYSLHFFSQILEIAPAAKGLFSFLRDSDEVPHNN 60  
 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||  
 Db 1 MGEIGFTEKQEALVKESWEILKQDIPKYSLHFFSQILEIAPAAKGLFSFLRDSDEVPHNN 60  
 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||  
 Qy 61 PKLKAHAVKVKMTCETAIQLREEGKVVVADTTLYLGSIHLSKSGVIDPHFEVVKEALLR  
 120 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||  
 Db 61 PKLKAHAVKVKMTCETAIQLREEGKVVVADTTLYLGSIHLSKSGVIDPHFEVVKEALLR  
 120 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||  
 Qy 121 TLKEGLGEKYNEEVEGAWSQAYDHLALAIAKTEMKQEEs 158  
 ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||  
 Db 121 TLKEGLGEKYNEEVEGAWSQAYDHLALAIAKTEMKQEEs 158

/Cathy K. Worley/

Primary Examiner, Art Unit 1638